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ABSTRACT

A study investigated whether: (1) deletion of relationals, which are function words in Japanese, from Japanese text affects the text processing strategies of native and nonnative readers, as measured by indices of reading time and comprehension; (2) nonnative readers' proficiency levels affect reading strategies when processing Japanese texts with relationals removed; (3) native readers or nonnative intermediate or advanced readers are aware of the missing relationals when exposed to such text; and (4) advanced and beginning nonnative readers can make appropriate corrections to relationals-deficient Japanese text. Subjects were 22 native readers, 36 advanced level nonnatives enrolled in Advanced Japanese courses; and 41 intermediate level nonnatives in the second semester of second year Japanese. Subjects were asked to read manipulated (relational-deleted) texts and explain them in written language, make corrections, and submit to an interview based on the corrections the subjects made in their writing. It was found that the removal of relationals did not have a significant effect on reading comprehension. Reading time was dependent on proficiency and text type. Only natives and advanced nonnatives were aware of relational removal. Results suggest that relationals should be taught in the context of discourse. The role of relationals in reading comprehension is seen as unclear. A 20-item bibliography is included. (MSE)

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Effects of Relationals Deletion in Japanese Texts

Reading in a foreign language requires more substantial cognitive effort than reading in one's native language. Second language (L2) research suggests that L2 readers' processing strategies might be language specific even though there are similar developmental trends for L1 readers (Oller & Tullius, 1973; Samuel et al.; 1978; Carpenter and Just, 1983; Saito, 1989). Furthermore, it has been suggested that reading processes and strategies of L2 readers who are learning to read a substantially different writing system such as Chinese or Japanese might use totally different processing strategies than when reading their native language (Bernhardt, 1986; Everson, 1987; Harada, 1988; Berkmyer, 1991).

Researchers who have investigated adult L1 readers of English using eye-tacking methodology found that as readers become more experienced, fixation duration, fixation frequencies, and the number of regressive fixations decrease. They become able to anticipate linguistic structure and adjust their fixations and fixation durations according to text difficulty, whereas less experienced readers appear to increase their fixations while maintaining stable fixation durations (Communale 1973; Hawley, 1979; Carpentar & Just, 1977). Furthermore, readers of English tend to attend primarily to content words and not to rely on function words (Carpenter & Just, 1980; Thebadeau, et al., 1982).

In L2 study, Saito (1989) examined Japanese readers of English using English texts from which the articles had been deleted. She found that Japanese readers of English processed texts similarly to native readers of English. Deleting articles from the text did not have any effect on reading comprehension for either

group. Even the very proficient Japanese readers of English had no awareness that articles had been deleted, but the native readers of English did notice their deletion.

In the case of German, however, Bernhardt (1986) found different processing strategies among native and nonnative readers of German. Unlike English readers, experienced readers of German used more processing time for function words than for content words whereas inexperienced readers of German spent more processing time for content words than function words. Readers of German appear to be gaining important information from functional elements.

The purpose of this study is (1) to investigate how native and nonnative readers of Japanese process information from Japanese texts by eliminating the relationals which are function words in Japanese and then (2) to examine to what extent the elimination of relationals effects reading comprehension. Additionally, this study also examines the extent to which native and nonnative readers of Japanese perceive missing relationals. For this study, the Japanese texts were manipulated in a way to match the readers' learning stage of the Japanese language.

The Japanese Writing System and Its Learning Stages

The Japanese language uses two syllablaries, Hiragana and Katakana (collectively referred to as kana), and a set of ideographs called Kanji. Both of the Japanese syllablaries have 46 basic letters and at present, 1945 kanji have been designated by the foundation of Japanese literacy as "Joyoo kanji," official kanji for daily use. According to a survey by Taylor & Taylor (1983), 1000 basic kanji included in the Joyoo kanji represent 91% of all kanji used in Japanese and 2000 make up 98%. Japanese children learn these 1945 official kanji during their nine years of compulsory education (from age six to fifteen or sixteen).

Learning all these kanji, first in single form, and then in numerous compound forms with multiple readings, presents a demanding task to foreign language learners. It has been generally assumed that foreign learners of Japanese must follow a progression similar to the native Japanese learner, albeit a little more quickly because they bring an educated adult mind to the process.

Typically, a college student with two years of Japanese is expected to have mastered about 300 to 400 kanji, this is still 60% less than junior high school reading ability. Japanese texts read by Japanese people are normally written with a mixture of kana and kanji, so the simultaneous mastery of both syllablaries and the kanji ideographs is critical for reading comprehension in authentic or 'normal' Japanese (Sakamoto & Makita, 1973). Therefore, L2 learners, too, have to master kanji to achieve proficiency in reading Japanese.

Authentic Japanese texts use kanji exclusively for content words, hiragana is used primarily for function words, and katakana exclusively for words borrowed from Western languages. At the beginning of the first semester students of Japanese are introduced to vocabulary in Roman letters (to help learn pronunciation) and then to hiragana and katakana. Kanji are gradually introduced from the second semester. Traditionally, it has been assumed that learning kanji introduces an increased degree of difficulty for students, therefore, beginning students are taught with just the kana (phonetic) writing systems as shown in Example 1. Later, as they acquire some basic Japanese vocabulary and grammatical structures, kanji are introduced as in Example 2. Students with differing degrees of proficiency will have mastered varying amounts of kanji vocabulary. Because there are so many

kanji, and kanji are used for content words, it is assumed that the number of kanji students have mastered is crucial for reading comprehension.

Romaji:	Tomu wa nihongo ga jyouzu desu.
Example 1:	トムにほんごがじょうずです。
Example 2:	トムは日本ごがじょうずです。
Example 3:	トムは日本語が上手です。

The texts used in this study use either kana only (Example 1), or 'normal' text (Example 3) which has kana and kanji appropriate to the subjects' current learning stage of reading Japanese.

Method

The following questions were addressed: (a) Does deleting relationals from Japanese text affect the text processing strategies of native or nonnative readers of Japanese, as measured by indices of reading time and reading comprehension? (b) Does the proficiency level of nonnative readers of Japanese affect their reading strategies when processing Japanese text that has been manipulated by removal of relationals? (c) When exposed to Japanese text that has been manipulated by removal of relationals, are native readers, advanced nonnative or intermediate readers of Japanese aware of the missing relationals in different text types? (d) Are advanced and beginning nonnative readers of Japanese able to make appropriate corrections to relationals deficient Japanese text?

Subjects

Subjects for this study were 22 native readers of Japanese, 36 advanced level nonnatives who enrolled in advanced Japanese courses, and 41 intermediate level nonnatives in the second semester of second year Japanese.

Research Design

The research design employed a 3 X 3 factorial design for statistical analysis. There were two independent variables; (1) Japanese proficiency level: (a) native, (b) advanced (nonnatives), and (c) intermediate (nonnatives), and (2) text type: (a) normal text, (b) experimental text 1, and (c) experimental text 2. Normal text includes both kanji and kana with relationals. Experimental text 1 is the same as the normal text except all relationals are deleted. Experimental text 2 is the same as experimental text 1 except that it is all written in kana.

Materials

The text chosen for this study was taken from Japanese Today (1973). The normal text contains 45 kanji, 99 hiragana, and 12 katakana. Experimental text 1 is exactly same as the normal text but all relationals have been deleted leaving 45 kanji, 69 hiragana and 12 katakana. Experimental text 2 has had all relationals deleted and it is all written phonetically in hiragana : 151 hiragana and 12 katakana .

Data Collection

The three dependent variables measured in this study were (1) reading time, (2) reading comprehension, and (3) the number of right corrections of relationals missing from the text. To measure reading time, the total amount of time spent processing the text was recorded with a stop watch. Subjects were instructed to take as much time as they needed for comprehension and that they would be asked to write down everything they remembered about the text after they finished.

Reading comprehension was assessed through recall-protocols written by the subjects after they read the texts. This measure of reading comprehension, immediate recall protocol, was used because it is considered a direct reflection of

what the reader has actually processed and understood about the text (Bernhardt & James, 1987). Subjects were asked to write in their native language to avoid the confounding effects of second language (Lee, 1986). A weighted propositional scoring system was developed for the text according to the procedure described by Bernhardt (1988). The scoring instrument was developed by three Japanese language specialists and achieved an inter-rater reliability index of .98.

To assess how subjects perceive missing relationals, the dependent variable, number of right answers, was counted via the correction task. Students were instructed to make corrections as they determined the need for them. The correction task reflects linguistic awareness, as measured by the correction task followed by an oral interview.

The purpose of the interview was to investigate readers' awareness of the relationals in the Japanese text. The investigator asked questions based on corrections the subjects had made. If the subjects were aware of the elimination of the relationals in the text, the investigator asked when and how they noticed the lack of relationals and how they read the text without relationals. Lastly, the investigator asked subjects if they believed that the missing relationals disturbed their reading process and also whether it affected their comprehension of the text. The total data collection time was 10 to 30 minutes per subject. All dependent variables were analyzed statistically using separate Analysis of Variance (ANOVA). Data obtained from interview sessions were analyzed qualitatively.

Results and Discussion

ANOVA Test Results

The results of the ANOVAs for three dependent variables detected that there were significant main effects for the variable of proficiency level: reading time, $F(2, 88) = 19.46$, $p < 0.0001$; reading comprehension score, $F(2, 88) = 35.94$, $p < 0.0001$; and number of right corrections, $F(2, 88) = 47.68$, $p < 0.0001$. Follow up tests using Student-Newman-Keuls test for reading time, reading comprehension, and correction task score revealed that all three groups were significantly different from each other ($p. < .05$). The results of this study clearly shows that as readers' proficiency levels increase, their reading comprehension ability and linguistic ability increase while reading time decreases.

There was a significant main effect for the variable of text type, number of right corrections, $F(2, 88) = 7.27$, $p < 0.0012$. Further analysis using Student-Newman-Keuls test revealed at the .05 alpha level that there was a significant difference between the normal text and both experimental texts, but that there was no significant difference between the two experimental texts. No significant main effects, however were detected for the variable; reading time, $F(2, 88) = 0.34$, $p > 0.7113$; and reading comprehension score, $F(2, 88) = 0.64$, $p. > 0.5315$. The ANOVA for reading time detected a significant interaction between the independent variables, $F(4, 88) = 2.98$, $p < 0.0232$. Figure 1 portrays the disordinal nature of the interaction. Student-Newman-Keuls test revealed at the .05 alpha level that there was a significant difference between native and advanced level group as compared to the intermediate level group dependent upon text type.

Insert Figure 1 about here

The Effect of Relationals Deletion in Japanese Texts

The results of this study reveals that reading time was significantly affected by different proficiency levels and different versions of text. Native readers of Japanese took approximately 2.4 times more time to read the experimental text 1 than the normal text and 4.6 times more time to read experimental text 2.

Qualitative data from interview sessions revealed how native and nonnative readers dealt with relationals deficient text. Native readers expressed experiencing more difficulty reading experimental text 1 than experimental text 2. Deleting relationals from the normal text made it difficult to process information smoothly because they had trouble finding a pausal unit. Content words followed by the appropriate relationals are the shortest pausal or meaning unit for reading Japanese text. Therefore, they were mentally inserting the needed relationals between kanji when many kanji were connected meaninglessly as in the following example:

私家父母歌歌う I home father mother song sing

Experimental text 2 was easier to read because there were spaces between words but it still took longer to read than experimental text 1 because the text 2 was written entirely in (phonetic) kana. A majority of the native readers who read either experimental text said that they had had to fill in appropriate relationals mentally to remember for their immediate recall protocol.

It is important to note, however, that even though native readers who were exposed to experimental text 1 or experimental text 2 seemed to struggle to process information, they were able to process about the same amount of information as with the normal text. This data indicate that, in the case of native readers of Japanese, reading comprehension scores were not much affected by the manipulation of text, probably because native readers were able to use other knowledge to put the meaning together.

Manipulation of the text also seemed to significantly affect both advanced and intermediate level students in terms of reading time, but in a very different way for each group. As shown in Figure 1, advanced level students took the longest time for the normal text, and then experimental text 2 while experimental text 1 required the least time among three text types. Intermediate level subjects took the longest time to read experimental text 1 and the shortest time for the normal text. The reading comprehension data indicate that the intermediate group seemed to struggle more to process information from experimental text 1 while they were able to get a similar amount of information from the normal text and experimental text 2. Although reading time was significantly affected by text types for both advanced and intermediate groups, reading comprehension scores did not seem to show any significant effect for either group.

Qualitative data from the interview sessions gave some insight to this phenomenon. Advanced level students who read the experimental text 1 thought the text was difficult to read because of too many unknown kanji. A majority of them expressed the feeling that if they were able to read in hiragana they could probably understand better. On the other hand, subjects who read experimental text

2 also thought the text was difficult to read because every word was written in kana. They believed that kanji represent meaning so reading kanji would help them for reading Japanese text. Although both groups have something to blame about the way the text was written, the kanji they didn't know correlated very highly to the hiragana words they didn't understand. This data seemed to indicate that the amount of vocabulary and kanji knowledge correlated very high (Koda, 1990).

Some knowledge of kanji however, caused distortion in reading comprehension. The word "jyoozu" in Japanese which means "good at" in English for example, was a very familiar word for intermediate level subjects, but they did not know the kanji. They have learned individual kanji "ue" and "te" but not as a compound kanji "jyouzu", and this totally distorted their reading comprehension.

上（うえ）"ue" = above, upper 手（て） "te" = hand 上手（じょうず）"Jyoozu" = skillful

The results from the correction task indicate that at all three proficiency levels, native, advanced, and intermediate level, subjects who were exposed to the normal text before the correction task scored higher than these exposed to the other two experimental texts. Even though there was an significant effect, this is interpreted as a "memory effect." In the interview session, subjects stated that they remembered correct relationals from reading the normal text. This memory effect did not occur in the previous study (Saito) with article deficient English text. Even Japanese who had attained a very high proficiency level in English did not remember the articles from the English text. Japanese has no relationals, and the

functions of articles in English text are quite different from the functions of relationals in Japanese text which are more similar to English prepositions.

Comparing the results for those subjects exposed to the two experimental texts, even though there is no significant difference between the two groups. The data seemed to indicate that there is no difference among native speakers, but advanced level students got higher scores on experimental text 1 (kanji) than on experimental text 2 (hiragana). The completely opposite phenomenon was observed for the intermediate group.

Native readers were able to fill in the appropriate relationals as they went along, but nonnative readers had to struggle finishing the correction task. The strategy used in this task for natives was that they simply sounded out the text in their minds and tested to see if it read smoothly. If it didn't sound right they figured out what was missing from the total discourse. Advanced level students also used the same strategy. When they encountered difficulty they referred to their grammatical knowledge and tried to figure out by translating it into their native language. The intermediate students also used a sounding out strategy but relied more on translation and referring to grammatical knowledge. They all seemed to think that grammar was not difficult at all but that it was difficult to figure out appropriate relationals because of too many unknown kanji or unknown words in the text.

Native readers of Japanese immediately noticed and were distracted by the missing relationals from the text but the majority of nonnative readers said they did not notice the missing relationals while they were reading for comprehension. Only very proficient readers noticed immediately and they were able to adjust their

reading strategy to get information from the text. The majority of native and nonnative readers said that the missing relationals did not particularly affect their reading comprehension.

Conclusions and Implications

This study revealed that deletion of relatiionals from Japanese text did not have a significant effect on reading comprehension. Reading time was affected dependent on readers' proficiency level and text type. Native readers of Japanese were aware of the missing relationals but only nonnatives who had attained a high proficiency level were aware of the missing relationals. Relationals in normal Japanese text become a cue of knowing word units for readers which is very different from European languages which have a space between each word. Figuring out the meaning without relationals, is thus confusing and takes longer.

Implications which may be drawn from the results of this study are that relationals need to be taught in discourse context, and there is reason to consider the earlier introduction of kanji to nonnatives in classroom situations. Rather than controlling the introduction of kanji, readers should be exposed to normal /authentic text with furigana (phonetic code in hiragana) on top of kanji as early as possible.

From this study, the extent to which function words such as relationals are important in reading comprehension is still unknown. Further research is needed in this particular area. Furthermore, it is possible that the length of the texts and complexity of sentence structure may have caused this result of no main effect of text type. Investigation of these specific issues is critical to understand to what extent L2 readers of Japanese use different reading strategies from other languages, and how reading strategies are language specific.

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Figure Captions

Figure 1. Interaction between proficiency level and text type as measured by reading time.